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## III FORESTS:

- \*Douglas fir
- \*Hemlock
- \*Oak
- \*Spruce
- \*Western yellow pine
- \*White pine
- \*Yellow pine

## IV FISHERIES:

- \*Cod
- \*Haddock
- \*Mackerel

## VII MANUFACTURED FROM FOREST PRODUCTS:

- \*Lath
- \*Shingles
- Turpentine
- Rubber, used in manufacture

## VIII MANUFACTURED FROM FISHERY PRODUCTS:

- \*Salmon, canned

## TRANSPORTATION

## IX TRANSPORTATION:

- Freight—ton miles
- Passenger—passenger miles

\* Included from 1904-1919.

## DISCUSSION

CARL SNYDER.—In his comprehensive work on *Business Cycles*, 1913, Mitchell pointed out as among the first requisites for a larger understanding, the need of an index of the physical volume of trade. An inquiry undertaken by the writer showed that a reliable index of the volume of trade was much more difficult of compilation than an index of production in the leading lines of industrial activity, including, of course, agriculture. But the preparation of this latter revealed that an index of production is likewise probably the most accurate index of trade that we have. There is probably no great variation in trade aside from the variations in product. That is to say, what is produced is very largely consumed year by year; and there appears to be very rarely any accumulated surplus of moment.

Probably the best general index of trade that we had was the bank clearings outside of New York City. It had been supposed that these grew more rapidly than the general trade of the country, and also that they were very greatly affected by periods of intense speculative activity, like those of last year.

Prior to 1890, these clearings did grow very rapidly, owing to the rapid extension of the clearing house system, and the actual number of clearing houses. Subsequent to 1890 these clearings, corrected for price changes by dividing by the Bureau of Labor's index of commodity prices, show a fairly consistent growth at the average rate of close to 4 per cent per annum. The preparation of an index of production revealed that the average annual increase in the product was practically the same. Periods of speculative activity do show a sensible variation between the two indices; but only for a brief time.

It is remarkable that, until the present year, there had been no serious effort to measure the total national product or its rate of growth over an extended period of years. This was the more regrettable, for it left the field wide open for the most conflicting views as to whether production in a given year was low or high, labor inefficient or the reverse, whether there was a scarcity of goods, and so on.

Professor Kemmerer had made an excellent beginning in his *Money and*

*Prices*, and Professor Fisher had attempted the same thing in the working out of his standard work on the purchasing power of money. Then, as so often happens, the problem was attacked anew this year, from somewhat different angles, by Dr. King, Dr. Stewart, Dr. Day, and the present speaker. A very substantial agreement appears between each of the investigations. Dr. King obtained weighted averages embracing 15 principal products; and these averages show a fairly steady rate of growth of about 3.4 per cent per annum. Dr. Stewart's line shows about the same trend. Dr. Day had not yet combined his series into a single line. We took simple averages of his unadjusted indices for his three series, and obtained a slope of close to 3.5 per cent.

We worked out three different series, first one of 28 principal products running back 40 years; then one of 49 items running back 50 years; and finally one beginning with these 49 items and adding others as rapidly as they were available, so that for the last 20 years the average was above 70 and latterly the total number of items 87. Unweighted averages were taken of these, and, save in the earlier period from 1870 to 1890, there was no substantial difference between the three series. Taking the slope only from about 1890, the rate of increase on the first was 4.3 per cent; on the second, 49 items, about 3.3 per cent; and on the longest list about 4.2 per cent per annum.

The problem of weighting is obviously a difficult one, and the method necessarily one of arbitrary choice. Happily, the number of items available is large enough so that, as Bowley, Mitchell, and others have been at much pains to demonstrate in other fields, there was no very marked difference, save in minor details, between these and the weighted averages of King, Stewart, and Day. In general all of these agreed in a slope, in the last 30 years, of around  $3\frac{1}{2}$  to 4 per cent.

Considering the amount of material available, its nature, and the considerable probability of error involved, it may now be said with confidence that this is approximately the annual rate of growth within the last generation. It will be noted that this rate is considerably lower than that estimated by Professor Fisher, and somewhat lower than that of Professor Kemmerer. This also disposes of the idea that the ton mileage of the railroads is a good index of production. For the last 40 years the freight traffic of the railroads, expressed in ton miles, has shown a remarkably even growth at the rate of about 6.2 per cent, or 50 per cent greater than any probable rate of production growth. This simply expresses the fact that, as the urban population grows and production is concentrated more in large centers, the greater must be the haul of food, fuels, and materials back and forth to feed and supply this population and their specialized industries.

The fact which stands out, of course, in all these investigations, is the amazingly even character of this production growth, and how very slight is the variation in the flow of goods from year to year throughout periods of wide prosperity or deep depression; how slightly it was affected by the war, and how little relationship it often bore to the prevailing spirit or traditional idea of any given time. Thus, the period after the great panic of '73 is usually referred to as one of the deepest depressions the country ever knew, and yet, beginning a year or two after that panic there appears to have been a very marked expansion, at a rate seldom equalled since. We

have here a transfer of the usual delusion that profits and prices are a measure of the real prosperity of a nation.

In the same way we see that there was, contrary to almost universal impression, no unusually rapid expansion in the late war. The peak appears to have been reached in 1916 or 1917—there was seemingly little difference in the total of the two years. And in the same way, contrary to almost universal expectation, there has been no great diminution since the war closed. So we had no huge surplus of goods to dispose of. On the contrary, there never seemed a greater scarcity than last winter and last spring; and never such an extraordinary rise in prices in peace times.

So far as we can judge, there has been, between the last five years, no very great difference in the total of the annual product; and the considerable increase in the rate in 1916-1917 has been compensated, apparently, by a somewhat lower rate since. From this I think we can say pretty surely that there is no huge overgrowth of manufacturing or productive capacity in this country, save perhaps in a few lines too obvious to need mention. So there does not seem any cause for apprehension that the present depression through which we are passing will be of any longer duration than those of the past; and in the minds of many careful observers the forces at work are such as to make this depression, for the United States perhaps, briefer and lighter than for any of the other great commercial nations.

In the same way it is perfectly evident that between the total of the national product and the general price level there is only the slightest discoverable relation, and this only of the briefest duration. Periods of the most rapid growth in production, as in 1874-1880, have likewise been periods of rapidly declining prices; and vice versa.

Hardly greater foundation has the traditional belief that "iron is the barometer of business." It is no doubt true that the volume of new construction makes up the larger part of that which we call the business cycle, that is, the variation between periods of expansion and relative quiescence. And iron and steel are, of course, a most important element in this new construction. It is further probably true that when the steel trade is good, other business is brisk and profits satisfactory. But just as the variation in the mercury tube in extreme depression and a "high barometer," when everyone feels buoyed up, is normally on the order of less than 5 per cent, so we may say that the difference in national product from one period to another is probably not much more—8 or 10 per cent at the outside, as measured by years.

The difference produced by extreme depression and prosperity in the iron trade is fairly set forth in the estimates of manufacturing products which have been given us by Dr. Stewart and by Dr. Day. For the rest, it is evident that the iron trade lags rather than leads the general expansion, and is one of the last of the industries to feel the turn of the tide, as was so notably evident this year.

But if the problem of measurement of the national product has now been disposed of, there still remains yet another, and that is the measurement of the current product; and for practical affairs this is of far greater importance. The variations in the business cycle, as Professor Mitchell has so clearly set forth, lie perhaps as much as anything in a dislocation between the even pace in the different lines of industry—too rapid expansion in one direction, too little in another, so as to disturb the normal equi-

librium. The whole of the national product does not greatly vary, but that of the several industries may vary quite widely. Now, in very large part, goods are exchanged for goods and services for services; and if there be overexpansion in this line or that, there comes inevitably overproduction in special lines, a period of crisis for these industries, unemployment, failures, and all the traditional phenomena of lack of balance.

This and little else is what is happening now. It is not because of any fall in our foreign trade, or because of overextension of credits abroad, or the inefficiency of labor, or any of the nine and forty special reasons which are always urged at such times. Our foreign trade has been good, but it has not been enormous. Its rate of growth over the last ten years was not deeply affected by the war. It is not now due, it does not seem to me, for any violent or long-continued collapse. And if national production has been at the peak of its history in the last five years, it is very evident that the idea of the inefficiency of labor is very largely a subconscious impression, or what Professor Ogburn would probably call a wish thought.

What is troubling us is simply industry out of balance. In certain particular and very obvious lines we have been going a little too fast. Now, if we wish to get rid of these periods, or cycles, of industrial disturbance, we ought to know that the several industries are marching in step, in other words, what is the current rate of production in the several lines. This is one question that has especially engaged my department this year. We have so far been able to obtain satisfactory indices in about 25 of the major industries of the country, including perhaps 60 or 70 per cent of the raw products and basic materials, and in some of the more fundamental manufactures, as the production of pig iron and steel, refined sugar, refined copper, and so on.

In the course of a few months we hope to have at least ten or a dozen more, and with these we shall have, I think, a very clear and accurate picture of the industrial flow from month to month. By reducing each of the industries to a common denominator, we shall know by means of index figures exactly whether we are producing very much more pig iron or copper or sugar, or importing much more rubber or silk or wool than the normal need. It was very striking, when we first obtained these indices, to note how clear was the overproduction in certain lines and the very large certainty that there would be inevitably a collapse in these special industries. In fact, from the relative height of the indices you could pretty well pick them off in the order in which the decline would and did come.

The preparation of these indices was obviously a much more difficult matter than the annual product. For here we have to deal with a wide seasonal variation. In many lines, as for example the milling of flour, the slaughter of meat, the production of sugar, cement, and, in fact, a majority of the industries, the variation may be very wide, amounting to as high as 30 or 40 per cent above or below the average for the 12 months of the year.

To work out this seasonal index it was needful to have the figures of production by months for a series of years, ten or twelve at least, and then to determine by examination of the scatter as to whether this seasonal was fairly even and whether a given industry tended to run fairly true to form. In most of the cases a fairly satisfactory seasonal was obtainable, in some less so. But now that we have some 25 or 30 of the major industries, the individual variations are ironed out so that, in the summation of the aver-

ages, we have a fairly good picture of the nation's monthly product. And as one industry after another is added to the list, the picture will, of course, become more complete and satisfactory.

A summary of these monthly indices in 1920, follows:

INDICES OF CURRENT PRODUCTION AND TRADE  
1920  
BASE: AVERAGE OF THE TWELVE MONTHS OF 1917=100  
SEASONAL VARIATION ELIMINATED

	1919 Aver- age third quar- ter	1919 Aver- age fourth quar- ter	1920 Aver- age first quar- ter	1920 Aver- age second quar- ter	1920 Aver- age third quar- ter	July	August	Septem- ber	Octo- ber	Novem- ber	De- cember
1. Pig iron . . . . .	82.2	71.5	98.5	90.5	100.2	99.4	100.9	100.4	98.5	93.2	85.0
2. Steel ingots . . .	83.4	73.9	98.5	90.0	96.9	98.2	98.8	98.7	92.7	86.0	75.5
3. Bituminous coal . .	91.6	75.8	99.2	96.4	96.0p	97.4p	98.3p	92.3p	99.4p	114.3p	110.4p
4. Anthracite coal . .	92.6	94.3	89.4p	85.1p	77.7p	94.9p	87.4p	50.9p	86.7p	89.7p	101.9p
5. Copper . . . . .	67.2	71.0	76.1	73.5	70.1	69.7	74.0	66.7	66.9	67.8p	60.8p
6. Tin deliveries . . .	64.3	114.1	98.4	92.3	97.7	114.7	77.7	100.8	70.8	70.4	53.5
7. Cement . . . . .	92.9	97.8	121.7	94.6	97.9	92.3	98.2	103.3	116.2	124.5	136.0
8. Petroleum . . . . .	123.8	119.1	125.5	134.3	140.8	140.6	143.7	138.2	144.4	141.1	142.1p
9. Gas & fuel oil rfd .	127.7	129.0	120.5	129.8	154.1	148.4	159.2	159.7	157.1	157.0	
10. Cotton consumption	90.7	91.7	97.1	96.1	88.7	94.4	87.7	83.9	69.7	59.1	52.4
11. Wool consumption	110.1	119.1	125.7	105.5	68.5	68.5	70.1	67.0	71.0	51.9	
12. Silk imports . . .	165.1	120.2	144.7	91.7	78.5	104.8	81.2	49.4	48.4	39.1	
13. Wheat flour . . .	119.8	109.2	113.1	95.1	97.0e	115.4e	94.7e	81.0e	82.1e	75.5	76.3e
14. Cattle slaughtered	105.1	104.0	107.0	97.9	92.5	89.3	91.5	96.6	82.4	89.3	74.4
15. Swine slaughtered	115.0	108.3	115.0	120.7	115.5	114.1	117.5	114.8	102.3	103.3	94.0
16. Sheep slaughtered	145.2	148.1	118.7	108.2	128.2	134.6	123.8	126.3	113.3	114.1	118.0
17. Sugar refined . . .	121.7	94.1	124.9	121.0	108.8	129.2	121.2	76.0	39.6	76.9	81.9
18. Tob., cigars & cigs.	98.4	106.7	113.8	106.4	93.2	91.7	93.0	94.8	87.4	83.0	78.3
19. Rubber imports . .	114.7	157.7	222.0	130.1	130.5	135.8	160.9	94.8	66.0	98.5	
20. Wood pulp . . . .	93.6	111.5	106.2	124.7	108.2	111.2	108.8	104.6	113.8	116.0	107.7
21. Paper . . . . .	113.5	118.7	125.5	131.0	132.2	138.6	132.6	130.4	126.2	105.1	90.4
22. Railway car output	181.6	103.2	52.7	37.7	40.5	30.0	43.7	47.9	66.2	68.5	85.0
23. Locomotive output	59.8	30.5	26.2	43.2	52.9	45.8	62.2	50.8	79.2	72.1	75.8
24. Building activity*°	78.3	73.4	56.9	36.1	33.9	33.1	37.5	31.1	29.4	32.4	37.9p
25. Imports ° . . . .	122.5	124.2	132.7	181.9	140.1	155.9	151.4	112.9	105.9	111.8	98.5p
Average of 25 comparable items	106.0	102.7	108.4		98.6	97.6	101.3	100.6	90.9	88.4	89.6
Bank clearings outside New York City . . . .	121.5	117.1	112.8	108.2	118.2	112.1	118.1	124.5	121.1	124.0	138.5p
Railway tonnage . . . .	103.0	97.1	108.8	104.8	117.6	118.8	118.3	111.5	111.6	103.8	94.8p
Employment, New York	95.5	98.6	102.7	101.9	98.8	100.8	98.3	97.4	95.8	89.1p	83.3p
Bank clearings, New York City° . . . . .	117.5	113.0	98.8	92.2	95.9	92.8	93.5	101.4	99.9	108.1	122.0
Shares sold, New York Stock Exchange . . .	179.0	199.1	152.4	117.3	89.6	81.1	88.7	98.9	88.4	142.7	156.1
Per cent of firms failing to firms reporting . .	.87	.36	.32	.41	.50	.48	.50	.52	.62	.70	.85
Exports ° . . . . .	106.5	78.9	96.7	99.9	95.5	108.7	92.9	85.0	89.0	90.0	99.4p
Foreign trade tonnage	105.8	107.6	121.8	121.0	139.5	128.8	142.6	147.2	165.6	155.5	

e Estimated

p Preliminary

\* Base = 1916

° Price change allowed for.

H. S. PERSON.—Mr. Wolman's paper is an argument for an extension of the factual basis on which the theory of production rests, and not a discussion of that theory. The thesis seems to be embodied in the following sentences: "While the first formulation of a scientific theory may contain all of the elements essential to a development of that theory, later influences may direct attention from these elements and thus limit the content of the theory. This is apparently what happened to the theory of production." "It is one of the functions of political economy to organize inquiries that attempt to supply the necessary evidence."

That "later influence" which has apparently directed attention from the elements essential to a proper development of a theory of production, according to the author, is the dominance of the price concept in industry and in economic theory; he believes that the relation between the real facts of production—physical output—and monetary valuation is far from simple and constant; that the habit of recording these facts in pecuniary terms has not only resulted in a misinterpretation of many of them but has, so to speak, laid a smoke screen between observers and a multitude of new facts of recent industrial development, and that our problem is now one of eliminating the smoke in order to observe these new data and bring them to bear upon the theory of production.

I agree with the author that the theorists have largely failed to observe and analyze these new data, particularly those pertaining to the technological and psychological aspects of industry. Their analysis would undoubtedly yield new corollaries to the theory of production, but I have no idea whether or to what extent it would modify the fundamentals of that theory. I believe also that the habit of recording the facts in pecuniary terms has hidden or perverted many of them, but I doubt whether that explains why the theorists have not kept contact with their data. The body of economists is not large; the routine of the classroom preëmpts the greater part of their energies; their research is highly individualistic, while the field of inquiry has broadened so much as to demand coöperative research; economists, like other folk, are subject to inertia and yield to the line of least resistance; above all, the new research requires actual participation in industrial operations—the most significant of the new facts cannot be observed from without. May not these circumstances go a long way towards explaining the theorists' inadequate knowledge of the technology of industry and of the psychology of worker, manager, capitalist, and entrepreneur?

When the economist has broken away from the classroom and from exclusive dependence on the library, he has brought back rich treasure. Carleton Parker placed himself cheek and jowl with the worker and the boss, and came back with new vision born of new facts; a Hotchkiss, Jacobstein, Leiserson, Willits, or a Wolman break away, sit at the table of negotiation with managers and workers, and discover new cold, hard facts of industry of which the theorist has not yet taken account in his reasoning; a Friday yields part of his abilities to the demands of industry, and is emboldened by what he observes to add a corollary to his theory of production—that the producers' out-of-pocket expenses be insured by the state. During the war many young economists were torn from their particular interests and in emergency service were made aware of the extent and depth of the untouched field of data and of the resources hidden in it. Let us hope that in

their re-adjustment to peace conditions they are not returning to exactly their former limitations.

These limitations to an adequate familiarity with the new facts of industry have been due chiefly perhaps to the economist's organization for the pursuit of his professional activity. He has been so limited in freedom for contact with industry as to have been able to make the contact with the high spots of industry only—with presidents, directors, and general managers; through annual reports and general reviews of business conditions. It has been felt that these high spots are the rich spots to tap, for it is there that results are summed up, judgments made, and governing policies determined. But the apparent advantage of such contact is precisely the disadvantage. In the first place, the point of view of the administrators in private industry is determined by the profits motive; their facts are translated into pecuniary terms, and their summarized data and judgment made on that basis. The economist, however, must interpret facts from the social point of view as well, in order to secure theories universally true; and to accomplish that end he should have the naked unit data. In the second place, the summaries at the top are not only inadequate summaries of the facts they represent but they ignore a vast quantity of vital facts at the bottom. Presidents and directors and many managers are as ignorant of the real facts at the bottom of their industries as are the economists; beneath the hard crust of surface facts is a seething boiling mass of facts seeking for expression at the top, of which they know only too little. It is not true that all administrators are ignorant of these facts (the Dennisons and other resident directors of relatively smaller units are not); but in the larger unit there is woeful ignorance and it is at the top of the larger industrial unit that the economist, for some reason or other, believes it profitable to have the contact.

Furthermore, non-coöordinated specialization among economists is in part responsible. Specialists in theory have remained too much aloof from the contacts which can furnish them the new data for their reasoning, and those whose specialization has afforded them contacts with the new data have too frequently lost touch with the formulators of theory and the results of their investigations have not become available to the latter. There must be specialization, the field is so vast, but we must learn how to coördinate it.

The theory of production which we have modified but little was formulated when the trading motive dominated a productive activity which expressed itself chiefly in the household and in the small factory. It is to be assumed that Adam Smith and his successors got a pretty good picture of the individual worker, the individual master, and the individual trader of that day, each the member of a homogeneous group. But since then, in the United States particularly, the changes have been momentous. The trading motive still dominates the mind of administrator and even of manager, but the elements of production he directs to his purposes are now infinitely varied, complicated, highly technological and psychological, and neither he nor we have more than scratched the surface in the effort to classify and appraise them. It is no longer merely land, labor, and capital—or management, labor, and capital—but hundreds of kinds of land, thousands of kinds of technical, material forms of stored-up capital and—who yet knows how many—kinds of workers, all offering a confusing number of permutations and combinations of practical situations. It is now a canon of management

engineers of the highest professional standing that there is no one best system of management which is transferable and applicable in detail to any two establishments; each establishment is a problem unto itself of development for productive efficiency. Is it unreasonable to assume that were the economist, like the management engineer, to spend a season in the shops and in the offices, he would find it necessary to at least supplement his standard theory of production by a large number of significant corollaries and exceptions? Might not the textbook in economics take on the appearance of a Latin grammar?

In such an excursion he would meet workers face to face and each with an individual temperament and reactions; he would be in practical relationship with those incorporeal entities called "labor organizations," no two of them exactly the same, no one yet understanding their motives and purposes or guessing what these will be tomorrow and again the next day; he would be puzzled how to adjust to his theory the claim of the worker that the latter's dedication of self to an industry is as much an investment to be capitalized and guaranteed an income as is the investment of capital; he would be still more puzzled over some workers' assertion that an individual's dedication of self to an industry is as much entrepreneurship as is any other kind of risk. He would meet the boss—the liaison officer between management and worker—and find him in his technical relations and psychology elusive and difficult to comprehend; he would have contact with the management and be amazed at the multitude of varying technological and psychological problems involved in coördination and direction; he would study the general manager—the liaison officer between entrepreneur and management—and find him between the devil of the entrepreneur's trading motive on the one hand and the deep sea of technological difficulties on the other hand. He would search for that clean-cut individual of economic theory—the entrepreneur—and wonder where to find him: he would observe stockholders who are theoretically entrepreneurs and practically irresponsible investors; bondholders who are theoretically lenders and practically controlling administrators. He would observe the motives for, consequences of, and reactions to arbitrarily overextended or overrestricted production. He would come away with a trunk full of recorded facts to classify and analyze, a haze of impressions to clarify, and possibly a number of corollaries modifying his conventional theory of production in the classroom.

In conclusion I take the liberty of offering a few practical suggestions to this national assembly of fellow-economists: Establish as a professional group a long-run policy of going after the elemental facts of actual industrial experience for what bearing they may have upon the formulation of a twentieth century theory of economics as follows:

1. Catch our incipient professor of economics while he is still a student, and inspire him to make an important part of his training, service in shop and office as a wage-earner in contact with fellow wage-earners, bosses, and technical processes;
2. When the time comes to add him to our teaching and research staff, organize his work in such manner as to permit occasional genuine excursions into the field of industrial service;
3. Appoint a commission of this association to develop plans for co-ordinated research in graduate schools;

4. Establish closer relations (without impairing the autonomy of either) between our schools of commerce or business administration and our graduate departments of economics—the former are accumulating data and formulating principles which would be available to the coming theorists;

5. Bring thinking managers and even workers into the teaching of theory—not in the conventional way of permitting them to talk on whatsoever they may choose, but in a manner which requires them to discuss, in the light of their experience, phases of theory which have been submitted to them in A B C terminology;

6. Establish closer relations with the engineers in their professional associations—they have begun to consider industrial problems in a theoretical way, and, although deficient in a background of training in the social sciences, they can bring keen and splendidly trained minds, and a fund of experience with technical processes and with men into our discussions;

7. Agree upon and formulate some method of standardizing the dollar, and educate business men and other electors and eventually the congress to the necessity of its adoption—then will be removed a defective instrument which makes for confusion in our measurement and valuation of the facts of production;

8. And alongside this more precise pecuniary measure of production in terms of "material units," start one under the auspices of this association, or promote one already established, and make it so useful as to compel its continuance by an agency of the government.

**WILLFORD I. KING.**—Logic appears to demand the consideration of theory before proceeding to deal with its application; hence, I shall first discuss Professor Wolman's paper.

I believe none of us will disagree with his statement that the measurement of the national income from year to year is a laborious task. It is by no means easy even to approximate it in terms of money value. The chance of error is somewhat increased if we proceed to convert this money value into a commodity index—in other words, into an index of purchasing power. However, I feel that the chief difficulty involved in this operation lies in the first step rather than in the second. The prices of different groups of commodities fluctuate in a manner so similar that indices of average prices are likely to be very much alike no matter what particular process is followed in their computation. Once given, then, the actual money or, to be more accurate, book income, it is perfectly feasible to obtain, through division, by any one of a dozen different types of index numbers, quotients which will represent with an accuracy ample for most practical purposes changes in the average economic welfare of the people.

The second problem mentioned by Professor Wolman, namely, the measurement of the changes in the national wealth from year to year, is, in the present state of our statistical knowledge, a decidedly more difficult one than that of ascertaining the national income. There are two chief obstacles in the road to success in this direction: first, we have less accurate and much less frequent measurements of the value of the components of our national wealth than we have of the various items composing the annual product of our different industries; second, no one seems to have taken the trouble thus far to construct an index number measuring the average changes

in value of our chief articles of wealth. Once a properly weighted price index has been computed showing the changes taking place from year to year in the average prices of such goods as farm and urban lands, houses, factories, office buildings, machinery, livestock, raw materials, household furnishings, etc., it will then be more practicable to ascertain changes in the real national wealth by dividing the totals of the money value of our possessions by this price index for the same year. As Lauderdale pointed out over a century ago, it is impossible for all values to rise together, hence this method would tend to solve the problem of what to do with rising values of land, minerals, and forests, for their rise would be balanced by falls in the relative values of other groups of commodities. It appears, therefore, that we can scarcely hope to obtain really valuable estimates of changes in the national wealth until some painstaking work is done in the way of computing an adequate index of average prices of the more important articles making up our national equipment.

I cannot share with Professor Wolman his apparent feeling that it is practically impossible to differentiate "the larger facts" from "irrelevant and insignificant detail." It seems to me that this task is one of the essential duties of a statistician and that it ought to be a prime function of economists. Details are all of interest to some one, but only a limited number of generalizations have any appeal for the great majority of mankind—or even for scientists. This is necessarily true because the human mind is incapable of visualizing more than a very limited number of facts at one time. The man who can best hew away all non-essentials and display the chief facts and forces in clear-cut silhouette is, to my mind, the scientist who has achieved the highest mark of success.

If I interpret correctly Professor Wolman's position, he believes that the development of economic theory will be greatly furthered by substituting, in general, training in psychology and industrial technique, for that in political science and economic history. As a matter of fact, is it not true that the field of economics has grown so large that no one can hope to cover it all? Furthermore, is there any advantage in attempting to delimit the field? Why not let students working along the borderland class themselves where they will? Whether the investigator calls himself a psycho-economist or an economic-psychologist is wholly immaterial so long as he is conversant with his line of inquiry and seeks to set forth the facts as they are.

Specialists in psychological and industrial economics we must have, as also men who study out in detail the historical development of economics and its legal and social relationships. But is it more essential that every economist should be an expert psychologist than that he be a trained historian or a skilled mathematician? Is there any real evidence, for example, that the theory of value would have been much further advanced today had economists been schooled in psychology and technique at the expense of history and mathematics?

I am inclined to doubt that lack of familiarity with industrial conditions and a poor understanding of psychology have really handicapped to any considerable extent the leading students in the realm of economic theory. The economist in a garret poring over musty tomes and dealing with mechanical automatons rather than with men as they actually exist may be a most useful character for a novel but it has never fallen to my lot to meet a Queed or even a near-Queed in real life. I am inclined to believe that

while better training in psychology and in the technique of industry are to be heartily commended because they will prove effective in opening up new fields of research, it is nevertheless probable that such training will improve relatively little the clarity of the reasoning required in dealing with such time honored subjects as the theory of value.

It does not seem to me that a lack of special training along the lines suggested by Professor Wolman has been the chief hindrance which has prevented economists from being as successful as scientists in other lines in establishing a large mass of accepted laws. I would suggest that the most important real obstacle which has prevented the attainment of this desired goal is the attempt of economists to state their ideas in the language of everyday conversation. The motive behind this policy is the admirable one of trying to bring the facts home to the masses of the people, but this effort has resulted disastrously in other directions. Because the words used by the man on the street have numerous meanings, economists have themselves become confused by their use or have spent the time in fruitless arguments over definitions which should have been devoted to the development of new ideas. But, still worse, this use of ordinary words for technical purposes has enabled charlatans of every sort to bury the studies of the real scientists in a veritable avalanche of wholly worthless pseudo-economic literature. Under these circumstances, how can one expect the man on the street, who is supposed to be the beneficiary of this policy, to pick out the few grains of gold among the great mass of debris? Since he finds no harmony of opinion but only numerous degrees of variance, he naturally concludes that economics is not a science but a mass of confused and aimless bickering and discussion.

The obvious remedy for this state of affairs is for economics to take refuge in that stronghold long ago sought out by nearly every other science, a complete technical terminology which the person ignorant of the science is totally unable to use. This, to my mind, will do more than any other one thing to advance economic science and to secure for it the general recognition and respect which it deserves.

The very fact that modern statistical economics has a technique so complex that to a considerable degree it excludes popular writers from the field, is today helping to gain prestige for this phase of the science. The addition of such carefully worked out studies of fundamentals as the set of indices of physical production just presented by Professor Stewart will do much to add to this feeling.

Furthermore, it is most gratifying to see that different economists working in very different ways should arrive at indices of production so similar as those which have recently been developed. I have plotted together Professor Stewart's index for manufactures and that published by the Harvard Committee on Economic Research and find that the two conform very closely indeed, both in trend and in cyclical fluctuations, though Professor Stewart's index is about ten points higher than the other during the years 1916 to 1919 inclusive. I have also compared Professor Stewart's index for all commodities with a similar one prepared recently under my direction for the Bankers' Statistics Corporation and find the trends almost identical throughout, though differences of a year appear occasionally in the cyclical crests. This is probably due to different methods used in converting reports for fiscal years to a calendar year basis and to different ways of

treating agricultural products. Professor Mitchell's index of the production of all raw materials differs somewhat from Professor Stewart's similar index for the years 1913 to 1918, but does not diverge widely therefrom.

The chief peculiarity of Professor Stewart's indices, both for all commodities and for manufactures only, is that they show a rise in production from 1916 to 1918 while the Harvard index and mine both show a fall during the same period. A study of the data leads me to believe that this difference arises from the fact that Professor Stewart has directly or indirectly weighted mineral products much more heavily than has been done in the other cases cited. Without making a painstaking investigation of the facts, it is impossible to express an opinion as to which weighting is the more logical one.

To my mind, however, the really significant fact is that the trends of all these independent indices, though computed in rather radically different ways, are so nearly uniform that there can be little doubt that they represent the approximate truth. This arrival at harmonious results concerning the volume of production seems to add another stone of some importance to the foundation for economic research.